POSTOPERATIVE TREATMENT.*

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In considering postoperative treatment, we must necessarily consider the proper preparation of patients for surgical operation, as it has a very important bearing on the postoperative condition. The rationale of preparatory treatment is based upon the principle that the entire system, and particularly the eliminating system, should be as nearly normal as possible. Robert T. Morris very strongly states that all the avenues of elimination should be open and active, in order to overcome conditions that lead to autointoxication and render infection more probable. I do not here intend to take up your time with the minor details of preparatory treatment, but will mention some of the important points that should be considered in order to make the postoperative condition most favorable.

Since many of our major operations are not performed in emergency cases, the patient should receive the preoperative attention that will tend to prevent postoperative complications. The kidneys and gastrointestinal tract should receive the proper attention. The gastrointestinal tract should be thoroughly cleansed for some days before operation, for if the patient is given a physic only the day before, as is often done, the bowels will retain more or less fermentative material. The patient should drink large quantities of water, several quarts a day, if possible. This procedure washes out the stomach and intestines, flushes the kidneys, fills the tissues full of water, helps to prevent suppression of urine, alleviates thirst, and helps elimination through the skin. In other words, it opens the three principal avenues of elimination.

In the last two years, as will be readily seen by the literature, surgeons have given more attention to postoperative treatment than ever before. Many operations have their particular postoperative treatment, which I will not consider, but there are general considerations which apply in common to a good many postoperative conditions.

The surgeon's responsibility does not end with laying down the scalpel but continues until convalescence has taken place. Many operative procedures would be rendered useless by failure to carry out the proper after-treatment. It would be of slight avail to cut a urethral stricture if the subsequent passage of the sounds were not rigidly enforced, nor would a good result be obtained following resections of bones and joints if no attention were paid to the position of the parts.

The purpose of after-treatment is to prevent complications, but failing in this, to recognize them early, be they simple or grave, and so intelligently to treat them as to give the patient not only the best chance for recovery but the best final functional result. Not only must the wound or injury itself be treated but the entire organism must be brought to as nearly a normal condition as possible. Each case must be studied individually as regards the previous habits of life and complicating disease. The mental status of the patient must be understood and the general physical condition must receive attention.

Postoperative Posture of the Patient.—Much has been said upon the important subject of the position of the patient, immediately following operations. Rest, bodily and mental, is the first consideration. It seems to be a custom or fancy, among American surgeons especially, that after all operations of severity, the patient must be placed in the dorsal or recumbent position, in which uncomfortable posture he is forced to remain, not being allowed to turn on either side for several hours or days. Allingham of England and Fowler of New York appear to be the first to abolish this ancient custom, to which there are many rational objections.

The proper position, I think, is the right side, when the patient is taken from the operating room or begins to recover from the anesthetic. The heart's action is not interfered with; the tongue drops to one side of the mouth and does not drop back into the throat; if the patient vomits, he can vomit more comfortably; regurgitation of the mucus into the trachea is not so likely to occur; the mucus in the stomach, which has probably been swallowed during the anesthetic or shortly after, and contains ether, more readily passes through the pylorus to the duodenum; and the patient is able to draw up his limbs and relieve the tension on the abdominal muscles. Later, he may be allowed to take any posture that is comfortable. This rule, of course, does not apply to patients that require a particular posture for drainage purposes.

Anesthetic Vomiting.—This is one of the first symptoms that we encounter in postoperative treatment. In the ordinary case it does not amount to much, but sometimes is persistent and prolonged for several days. When not traceable to other causes, uncontrollable vomiting must be attributed to nervous disturbance. The character of the vomit does not differ from that of typical anesthetic vomiting. These patients continue to vomit in spite of ordinary treatment. In such cases, systematic lavage of the stomach must be practiced and repeated at intervals of four to eight hours, until vomiting ceases. Instead of using the tube, the patient may be given large draughts of water containing some alkali, as bi-carbonate of soda. Following the lavage of the stomach 1-12 gr. cocaine hydrochlorate, 5 gr. bismuth sub-nitrite and ½ gr. cerium oxylate may be given dry on the tongue. Spraying the nose and throat with 4% solution of cocaine will be found useful in some cases. Frequently rinsing of the mouth with cold water will add to the patient's comfort. I do not advocate the use of morphine, although it is recommended by others. It may decrease vomiting temporarily, but tends itself to cause persistent nausea and vomiting.

In neurotic individuals, the use of counter-irritation over the epigastrium by means of a mustard plaster or even the thermo cautery may be useful.

I have seen one patient, who vomited for ten days after an ovariotomy and to whom no treatment was of avail. The vomiting finally stopped sponta-

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neously. Nutrition, in this case, was maintained by nutritive enema. All medication by the mouth should be withdrawn while the attacks of vomiting continue.

Pain.—Morphine should not be given if its use can possibly be avoided, especially in laparotomy cases. Here, even small doses of morphine stop the peristaltic action of the bowels and cause distention. In neurotic cases, hypodermic injections of sterile water will often suffice. The pain usually stops in twenty-four hours, but in patients who are restless and neurasthenic it often continues longer.

Postoperative Shock.—Postoperative shock and hemorrhage are termed by some surgeons collapse. Pure collapse and pure shock may possibly be distinguished in laboratory experiments, but clinically the two are usually so closely combined as to render distinction impossible. So far as the treatment is concerned, they are identical. Some surgeons term collapse an inhibition of the vaso-motor center in contrast to shock, which is exhaustion of the center. The etiology of surgical shock has never been fully determined or satisfactorily explained.

The condition is defined by Gould as "a relaxation or abolition of the sustaining and controlling influences which the nervous system exercises over the vital organic functions of the body, the result of a profound impression made upon the cerebrospinal axis, either directly through the agency of an afferent nerve or through the circulatory system."

According to Warren, postoperative shock is a peculiar state of reflex depression of the vital functions, especially of the circulatory system, due to nervous exhaustion resulting from irritation of the peripheral ends of the sensory and sympathetic nerves followed by marked lowering of the vital powers and relaxation of the vaso-constrictors.

The degree of shock is dependent upon the severity of the irritation as well as the length of time which this continues in existence. In the treatment of shock it is well to remember that the symptoms of shock, which appear during or immediately following an operation, are often so closely interwoven with those induced by toxic quantities of the anesthetic or those dependent upon asphyxia that they may easily be attributed to other causes, or conversely, the toxic phenomena may be erroneously referred to surgical shock.

In determining the character of the shock, the condition of the system prior to the operation or the time required to complete the operation should be taken into consideration. If the pathology of shock is due, as has been stated by some authors, to vaso-motor disturbance and relaxation of the vaso-constrictors, I think the use of adrenalin chloride the best treatment for this condition, and have noted marked change in the character of the pulse after the administration of 30 min. of adrenalin chloride. I think, at this stage, the use of large doses of strychnia, digitalen, normal salt solution, and especially nitro-glycerine, which has become a matter of habit, and is mentioned only to be condemned, is in direct contrast to the pathology.

The recent experiments of Crile and the conclusions which he has drawn have awakened general interest. Crile believes that the essential features of surgical shock are the exhaustion or paralysis of vaso-motor centers which control the tone of the peripheral circulation. To the surgeon of to-day the essential fact brought out by Crile's experiments is that strychnia in very large doses, as it is now often given as a stimulant in the treatment of shock, is practically of no value, and in pronounced cases may even increase the condition it is intended to relieve.

The action of the heart is decidedly weakened during shock, and large doses of stimulant causes it to contract with great force for a few beats and finally stop in dilatation. On the other hand, if the heart can be kept going with small doses of stimulant until the vaso-motor system regains its equilibrium, no damage is done; but I think that many patients are over-stimulated during shock.

As a prevention of shock, all operations should be performed as rapidly as is consistent with good surgery, and all unnecessary exposure and manipulation of parts especially connected with the sympathetic nervous system should be avoided. This is especially true in brain surgery, and in cases of trephining after injury, where a considerable degree of shock already exists, the use of the mallet and chisel only increases this condition. In cases of collapse from hemorrhage or shock, and during the course of severe abdominal operations, there is little doubt that information concerning arterial pressure will be of value to the surgeon. Many forms of apparatus have been devised to serve this purpose. The Riva-Rocci instrument, which has been in use since 1896 in Italy and has been introduced in this country since 1900, appears to have as many advantages as any other instrument brought to our attention. It is probably sufficient for all clinical purposes. It may be that Cushing takes an enthusiastic view of the matter in his predictions that in appropriate cases the routine observations upon blood pressure will soon come to occupy the same relative position that pulse and temperature occupy at present.

When the condition of the patient or character of the pulse is such as to predispose to shock or sudden or unexpected loss of blood, providing the source of the hemorrhage has been stopped, or if from any other cause we recognize symptoms which indicate impending shock, preventive measures should be adopted at once, such as the use of adrenalin or alcohol. I believe, in such cases, the use of alcohol or adrenalin previous to the operation is a very important preventive measure, and alcohol especially if the condition is likely to be psychical. As regards adrenalin, it may be stated that this drug is contra-indicated by possibly interfering with the renal secretion, but given with alcohol, I think this is partly overcome.

Postoperative shock has been divided into four different classes: first, surgical shock due to vaso-motor depression, nervous exhaustion or vital depres-

sion without hemorrhage, second, shock as the result of hemorrhage, third, postoperative shock from the toxic effects of the anesthetic, fourth, shock produced by mental disturbance—sometimes called nervous collapse.

The diagnosis of the particular form of shock is a very important factor in the treatment of shock. For instance, in shock due to vaso-motor depression or nervous exhaustion without hemorrhage, the patient immediately, or within an hour or two following the operation, passes into a condition of more or less profound prostration, and the absence of hemorrhage and the exclusion of the anesthetic narcosis will be obvious reasons for diagnosing this form of shock. In the treatment of this form of shock, according to the experiments of Crile, the best results have been obtained by the use of morphine, alcohol and adrenalin, administered hypodermatically, and alcohol by rectum or other nutritive enema. In postoperative treatment, it is very important to wash out the rectum, first removing all mucus coating thereof, that prevents the absorption of the enema. Another important point is that the enema should not be of large quantity, not more than four to six ounces of liquid, as large quantities, under these conditions, are often not well retained on account of the relaxed condition of the sphincters; but no trouble is encountered with the retention of small quantities of liquid. Strychnia can be used in cases where there is embarrassment of respiration.

Dr. N. C. Morse, of Iowa, who has given the question of postoperative treatment a great deal of consideration, objects to the Trendelenburg position in this form of shock, and especially so if the patient is plethoric, as it causes congestion of the already congested vessels of the head and tends to aggravate the condition. Capillary congestion may be relieved by vigorous rubbing, and cloths wrung out of hot mustard water may be applied to the pectoral region.

Shock as the Result of Hemorrhage.—This is the most fatal form of postoperative shock. It is this class of cases that taxes severely the resources of the attending surgeon. The diagnosis of this form of shock is not difficult except when the hemorrhage is concealed.

To rely upon strychnia or other heart stimulants in this form of shock is fatal. The recognition of hemorrhage or the loss of blood and the checking of the hemorrhage is the first and most important thing. While this is being done, the patient's head should be lowered for two purposes: to keep the brain active by nourishing it with what little blood there is in the body, and possibly elevating the point of hemorrhage to make the blood pressure less at that particular point. If the patient is in a very bad condition, do not simply elevate the bed a few inches, but stand the patient almost on his head, if necessary, until the hemorrhage can be checked. After the bleeding is stopped, use saline solution (subcutaneously and rectal), alcohol, and possibly strychnia. Elevate the limbs at right angles to the body and, if necessary, bandage them tightly to force what little blood there is left to the brain. Also, compression of the abdominal aorta in many cases may serve as an important aid while the hemorrhage is being checked.

Difference Between Shock and Hemorrhage:

Symptoms in general	Shock	Concealed hemorrhage.
	Often regressive	Always progressive!
local symptoms	Absent	Often present, e. g. cough; localized pain or tenderness; abdominal distention; vomiting; hematemesis; hematuria; etc.
Mentality	Dull; stuporous	Active
Restlessness	Slight.	Often great
Pallor	Moderate	Very marked—especially of mucous membranes; progressive
Sweating	Frequently present	Usually absent
Respiration	Rapid	Marked and increasing "air-hunger"
Pulse	Rapid and weak	More and more rapid and weak
Effect of intravenous infusion	More or less lasting	Transitory.
Effect of other stimulants	More or less lasting	Transitory.
Temperature	Variable; may be subnormal	Often markedly subnormal
(Specific gravity of the blood	Increased	Decreased)

Shock from the Toxic Effects of the Anesthetic.—Here the symptoms usually appear during anesthesia or very shortly afterwards. The patient has the ordinary symptoms of shock but of milder type. Here strychnia is important as a restoratory stimulant. The Trendelenburg position should be used as the pathology of this form of shock is often cerebral anemia. Artificial respiration, oxygen and dilatation of the rectum and the application of warmth should be used.

Shock Produced by Mental Disturbance.—This occurs in neurotic and alcoholic patients and those of very timid character, and often very trivial operations cause all the phenomena of profound surgical shock. Fortunately, fatal cases are exceedingly rare, the usual type being mild and transient in character. The introduction of a sound in the urethra has been followed by severe shock and the introduction of an aspiratory needle into the pleura has been followed by immediate death. Relaxation of the sphincters, polyuria or profuse diarrhea may be cited as signs of psychic shock. It is characteristic of this form of shock that it is late in developing. The diagnosis is ordinarily easy when there is present restlessness, excitability and the characteristic expression of the face, and there is absence of hemorrhage or anesthetic narcosis and especially when we have reason to believe from the character of the operation that the nature of the shock must necessarily be of neurotic origin. Delirium often follows this form of shock in neurotic patients. Extreme alcoholics usually develop delirium after traumatism.

The treatment of this form of shock is often symptomatic. If a child, remove the feeling of fear. If an alcoholic, give alcohol. All active measures or excitement should be avoided. Rest and perfect quiet, as far as possible, should be enforced. Bro-

mides are highly recommended. The alleviation of pain by morphine is often necessary and morphine can be readily used, as this form of shock is often late and after the secretion of the kidneys has been established.

OPSONIC INDEX AND VACCINE THERAPY.

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For many years scientists have been trying to explain the phenomena of immunity. Pasteur ascribed the death of the germs in the body to the exhaustion of suitable food. Others thought that the germs secreted products which gradually produced their own destruction. The theories which have enjoyed the longest life are those generally known as the cellular and the humoral, and their advocates have been divided into two schools. According to Metschnikoff and his followers, certain movable body-cells prevented or inhibited microbic invasion. On the other hand, Pfeiffer, Buchner, Bordet and particularly Erlich, have contended that the germs do not prosper in the system, owing to the antagonistic action of substances in the body-fluids. More recently Buchner has admitted that part of these substances undoubtedly have their origin in the polymorpho-nuclear leukocytes, thus seemingly abandoning the purely humoral theory. Metschnikoff, however, maintains that the substances actively concerned in the destruction of infecting bacteria, never act outside of the leukocytes. Neither theory has satisfactorily explained all questions. If, as Erlich assumes, immune substances are produced by those cells upon which bacteria exert their nefarious action, how may one interpret the natural immunity towards the many harmless saprophytes? And if Metschnikoff is correct, why do not phagocytes attack all bacteria? If we admit that active immunity has educated the cells to withstand certain bacteria, why is it that if in passive immunity the cells are stimulated, this immunity is exhibited only towards certain micro-organisms?

The work of Denys and Leclef,[1] Leishman,[2] Wright,[3] and Douglas[4] has resulted in the elaboration of a new theory, a theory which takes a stand really midway between those of the cellular and the humoral schools. This theory admits the fact that the remarkable activity of the leukocytes is a great factor in defending the system, but it maintains that the leukocytes are powerless to destroy the bacteria unless these have been previously influenced or prepared by the action of certain substances in the serum. These substances were given the name of "opsonins" by Wright, and he particularly emphasized the importance of estimating their amount in individual cases for diagnostic and therapeutic purposes.

The object of this paper is to call attention to the results obtained by the use of bacterial vaccines, generally speaking, and to show why the technic of determining the opsonic index was destined, in its present form, to meet with disfavor.

In order to disillusionize any who may think that Wright has given us an unassailable theory as to the causation of immunity, the following facts, as yet unexplained, are simply mentioned.

a. The bacteria of the same group as the bacillus of diphtheria are taken up by the leukocytes as well with heated serum as with normal serum. The question arises as to whether this is due to spontaneous phagocytosis in the absence of opsonins, or whether it is due to the presence of a thermostabile opsonin (all others are thermolabile).

b. Many experiments with corpuscles obtained from various animals have shown that very infectious strains of germs are frequently more easily taken up by the phagocytes than less virulent cultures. This would seem to place our capillary tube experiments in contradiction with animal tests. For it has been similarly shown that a normal serum markedly bactericidal for anthrax, is by no means an indication of an animal's corresponding resistance to the disease.

For the *determination of opsonic indices* of patients, we require (1) normal sera for controls and the sera of patients, (2) washed corpuscles, (3) bacterial emulsion.

To obtain these various sera it is best to use the curved glass tubes devised by Wright. By wrapping a piece of bandage around the finger, a venous congestion is produced. One end of the closed glass tube, drawn out to a point, is used to stick the finger near the root of the nail. Both ends are broken off and blood is drawn up through the short limb, the lumen of which must not be too narrow. The straight end is again sealed with the flame, at a distance of 4 to 5 cms. from the body of the tube, so as to avoid heating the blood. The rarefied air now contracts and the blood is drawn further in, leaving the other end a bit free, so that it, too, can be sealed, though this is not necessary if it is to be used immediately. (One must always use freshly obtained sera in this work, as the opsonic power is gradually lost on standing, and this loss varies with different sera.) The blood is allowed to clot, and the tube suspended by its bent limb into the tube of a centrifuge and centrifuged. The serum being thus obtained, the bent limb is snapped off.

(2) A few drops of blood are received into a small glass tube two-thirds filled with 1.5% solution of sodium citrate. This solution disintegrates rapidly, so that it is best to make fresh solutions daily. The blood is well mixed and the tube centrifuged until the corpuscles settle. The clear fluid is pipetted off, and the corpuscles mixed with enough 0.85% salt solution to fill the tube as before. After again centrifuging and removing the supernatant fluid, the corpuscles are mixed, and are now ready for use. No attempt is made to preserve the thin gray upper film, rich in leukocytes, this having been found useless and time consuming. These corpuscles can be obtained from any person, provided that they are not subject to agglutination with other sera; it is more satisfactory to have the